



Environment and
Climate Change Canada

Environnement et
Changement climatique Canada

ECCC-ESTS SCIENTIFIC SUPPORT TO OIL SPILL RESPONSE

C-NLOPB Spill Prevention and
Response Forum

January 13, 2021



Environment and Climate Change Canada's 50th anniversary
50^e anniversaire d'Environnement et Changement climatique Canada

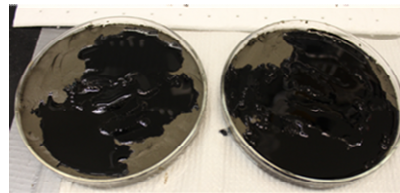
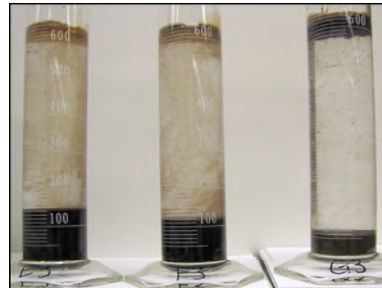
Meteorological Service of Canada's 150th anniversary
150^e anniversaire du Service météorologique du Canada



Canada 

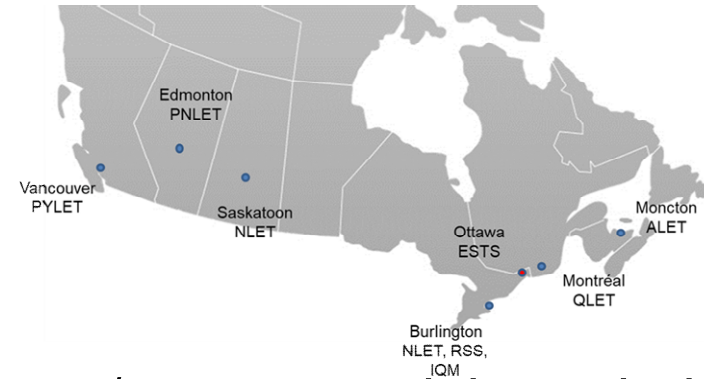
EMERGENCIES SCIENCE AND TECHNOLOGY SECTION

- ESTS within the Science and Technology Branch of ECCC provides scientific expertise on environmental emergencies involving hazardous materials
 - Emphasis on petroleum fuels and oils
- Lab-based facility with ongoing studies in areas of expertise
 - Oil properties
 - Environmental behaviours
 - Spill modelling
 - Detection, remote sensing
 - Sampling and monitoring
 - Analytical support
 - Shoreline assessment
 - Countermeasures
 - Health and safety



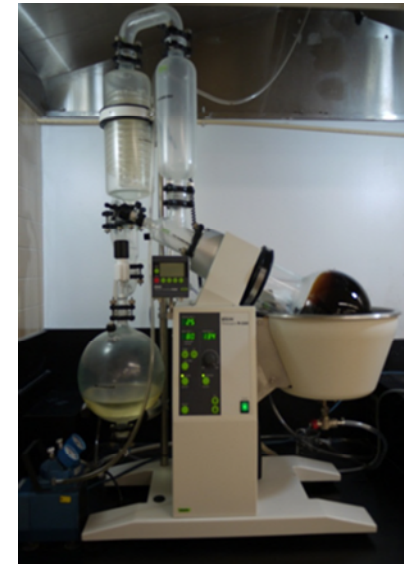
EMERGENCIES SCIENCE AND TECHNOLOGY SECTION

- Specialized unit within Environmental Science and Technology Laboratories Division, a national network of six regionally located laboratories
 - Analytical support for organics, inorganics, metals and toxicology accredited to ISO17025
 - Leverage a broader base of analytical capabilities
- ESTS operational support to spill incidents is available 24/7, accessed through the ECCC National Environmental Emergencies Centre
 - Fate and behaviour
 - Spill modelling
- Other: analytical support to environmental enforcement, review of resource project proposals for impact assessment related to spill response considerations

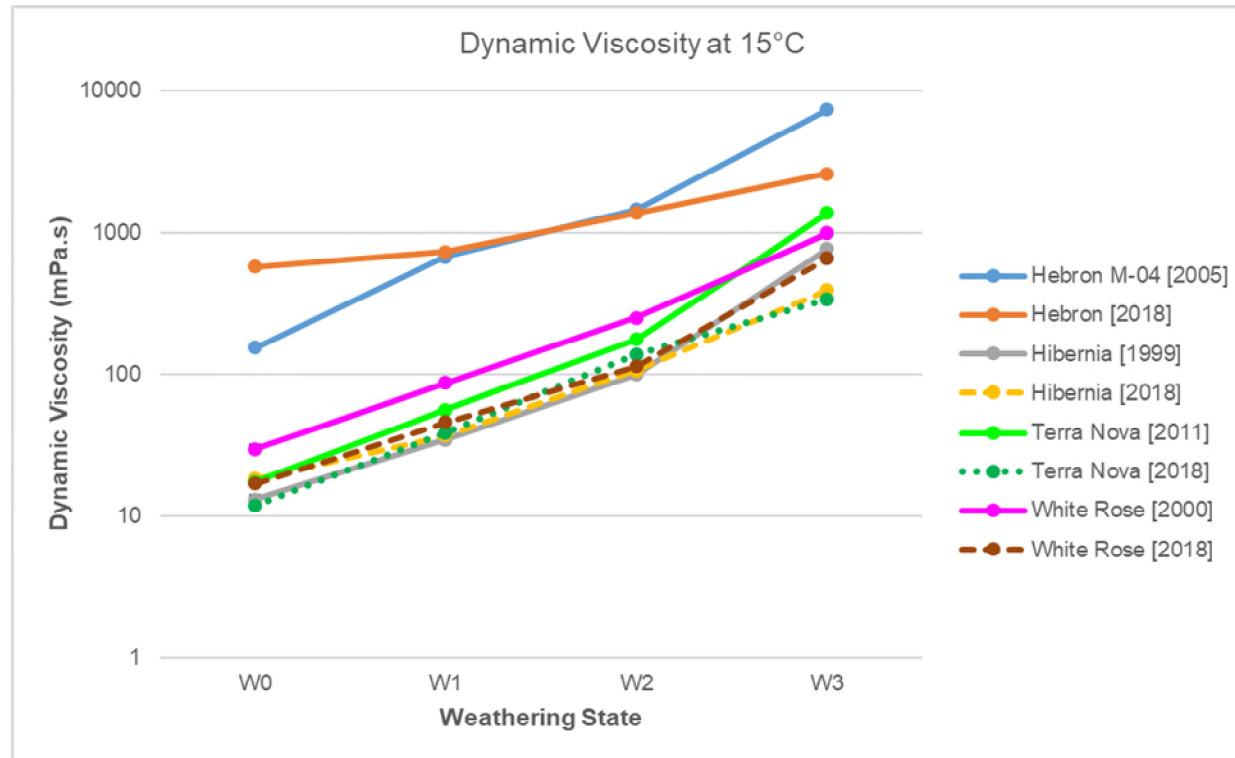


RESPONSE SUPPORT - OIL PROPERTIES

- 35+ year effort to analyze environmentally relevant properties of oils
 - Oil properties database approaching 500 oils at <http://donnees-data.intranet.ec.gc.ca/geonetwork/metadata/eng/bbe47635-805a-4580-a98d-9674e5b0c3de>
- Physical properties
 - Density (0 and 15 °C), Viscosity (0 and 15 °C), Interfacial tension (0 and 15 °C)
 - Flash point, pour point, w/o emulsion formation
- Chemical properties
 - Hydrocarbon content (TPH, TSH, TAH, resolved components)
 - CCME fractions, alkanes, BTEX, polycyclic aromatic compounds, biomarkers
 - Hydrocarbon groups (SARA), simulated distillation
 - Sulphur content, water content
- Multiple artificial weathering states (evaporative loss)
- Available as individual reports (~8 pages of data each)
- Set of oils from offshore NFLD received in Fall 2018
 - Bulk of analysis complete, current delays in completing lab work



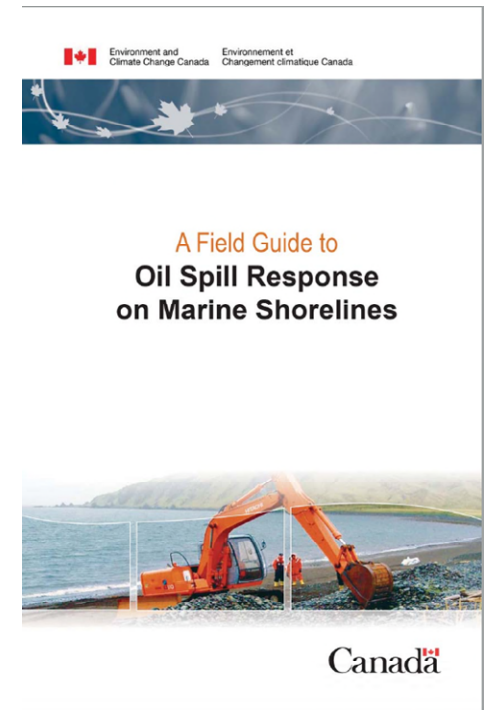
OIL PROPERTIES – VISUAL GUIDES



- Graphic depiction of the data, with interpretive notes
- Several oil groupings being developed, including offshore oils

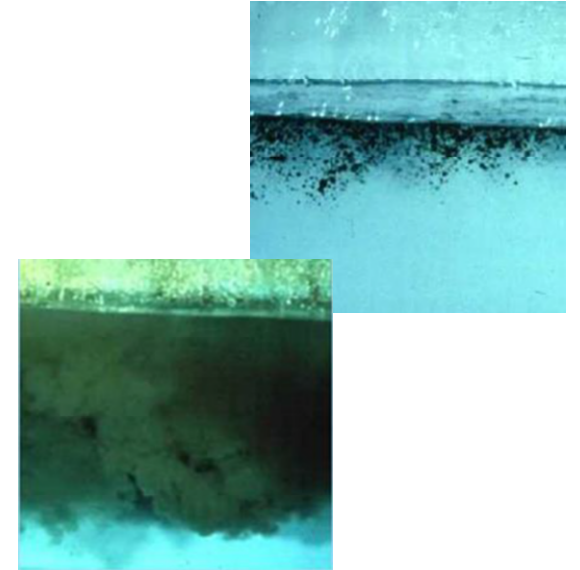
RESPONSE SUPPORT – GUIDES AND REPORTS

- Technical guides and manuals to consolidate information for use by responders
 - Recent publications include the SCAT 3rd edition and the marine shoreline guide
 - Topics under development
 - Waste management
 - Sampling
 - In situ burning (update)
- Guidance documents for alternative response measures
 - Targeted information to inform authorities on decision to permit use
 - Six priority classes planned
- Digitizing past publications
 - AMOP Technical Seminar proceedings
 - ECCC-EPS reports
 - Internal reports



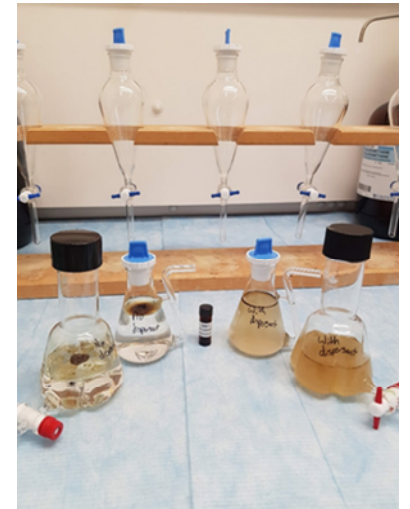
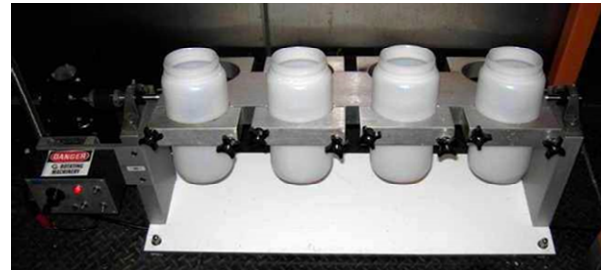
REGULATORY SUPPORT – SPILL TREATING AGENTS

- Products that are applied to oil to alter behaviour in the environment to facilitate response and clean up
 - Examples: dispersants, surface washing agents, herders
- Inclusion of STAs for spill response in offshore since 2015
 - COGOA jurisdiction only (not ship-source)
- Permitted if:
 - Included in operator's spill response plan
 - CCO determines that use will have a net environmental benefit
 - STA product is listed on a regulation published under the authority of the Minister of Environment
- Currently one dispersant and one surface washing agent listed
 - Selected based on the extensive knowledge from testing and use on oil spills worldwide for both effectiveness and environmental effects



EVALUATION OF STA PRODUCTS

- Objective: Identify products that promote net environmental benefit
 - High efficacy to achieve treatment objectives
 - Low risk of additional environmental impact
 - Other considerations (chlorinated compounds, heavy metals, breakdown products, etc)
- Representative laboratory screening tests
 - Testing under controlled conditions
 - Tests conducted internally by ECCC
- Establish criteria for listing as well as guidance for best options
- A range of candidate products
 - Dispersants
 - Surface washing agents
 - Herders



DISPERSANT TESTING - EFFECTIVENESS

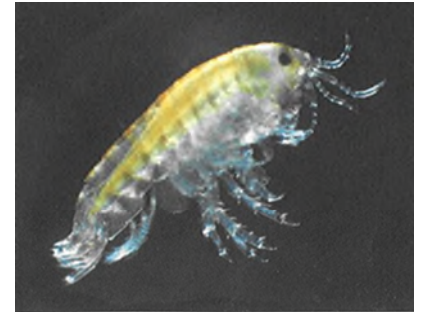
- Two ASTM standard methods
 - Swirling Flask Test
 - Low energy test (non-breaking waves)
 - Baffled Flask Test
 - High energy test (breaking waves)

- Examine a range of critical factors
 - Energy
 - Temperature (0 and 15 °C)
 - Oil type (2 standard oils)
 - Weathering (4 states)
 - Salinity (fresh to marine)



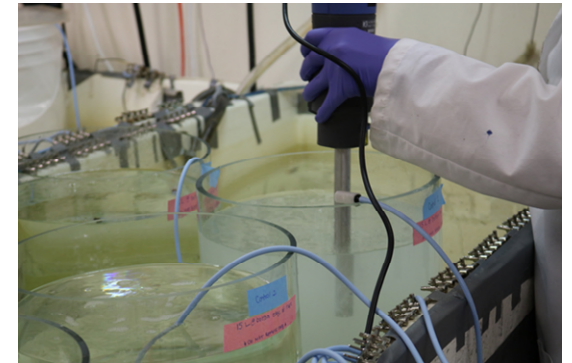
DISPERSANT TESTING - TOXICITY

- ECCC reference methods
 - Existing tests developed and accepted for regulatory use
- A range of species and tests available
 - Three-spine stickleback (fish)
 - Polychaete in sediment (worm)
 - Amphipods (crustacean)
 - Echinoid fertilization and growth
 - Microtox (luminescent bacteria)
- Lethal and sub-lethal effects
- Water column and sediments



DISPERSANT TESTING - ALTERNATIVE

- Aqueous-phase testing of dispersants is challenging
 - Low solubility causes concentration variability
 - Exposure is not consistent; comparison between products challenging
- Alternative test approach devised to provide comparison on an equal basis
 - Isolate dispersant effect by mixing with non-toxic oil surrogate
 - Establish consistent concentration profile over time (declining as droplets destabilize)
 - Exposure to stickleback as test organism
 - Pass/fail result



THANK YOU

Stay safe!

